

TITLE: Estimating Snag Densities and Down Wood with Aerial Survey Data

LOCATION: Pacific Northwest Region

DURATION: Year 2 of 2 year project **FUNDING SOURCE:** Fire

PROJECT LEADER: Keith Sprengel, Forest Health Protection, 503-668-1476, ksprengel@fs.fed.us

COOPERATORS:

Wildlife Ecologist: Kim Mellen, USDA Forest Service

Entomologists: Beth Willhite, and Bruce Hostetler, USDA Forest Service

GIS Specialist: Julie Johnson, Forest Health Protection (FHP)

Other potential cooperators not yet confirmed include: Washington Department of Natural Resources (WADNR), Oregon Department of Forestry, *USDA Forest Service, and *Bureau of Land Management.

Fuels planner: Jim Wrightson, USDA Forest Service

Wildlife Biologists: Alan Dyck, and Sharon Hernandez, USDA Forest Service

Silviculturist: Nancy Lankford, USDA Forest Service

PROJECT OBJECTIVES:

This project investigates the accuracy of aerial survey recorded cumulative mortality with the following objectives in mind:

1. Assess the impact of bark beetle caused mortality on standing dead and down fuels.
2. Assess the ability of aerial surveys to consistently make conservative estimations of snag and large tree densities and distributions at watershed scales.
3. Evaluate fuel loading for selected sub-watershed and investigate possible correlations with aerial survey recorded mortality.
4. Develop and assess plot-based derived (FIA/CVS) conversion factors for aerial survey data relative to wildlife habitat types and significant trees per acre and diameter breakpoints identified in the Decayed Wood Advisor (DecAID).

JUSTIFICATION:

Linkage to FHM Detection Monitoring

Current conditions of deadwood at the required minimum scale of 5th field hydrologic unit class (HUC) watersheds are difficult to assess. Ideally, recent ground-based snag and/or down wood inventories are available for constructing 'current condition' histograms. These, however, are expensive to conduct and often unavailable. Systematic forest inventory measurements, such as FIA, which are sample points on a widely spaced fixed grid and are staggered over time, are usually inadequate for assessing deadwood conditions at minimum scales. Aerial surveys, however, are conducted annually over 100 percent of the forested lands in the Pacific Northwest (see Aerial Survey Procedures).

Aerial survey data can aid managers in developing a picture of the 'current situation' for the incidence and condition of snags and potentially down wood across a landscape. There has

been, however, little work done to evaluate the relative accuracy of using aerial survey data to capture the extent and severity of these disturbance events over time on a landscape scale as recorded in the Detection Monitoring phase of FHM.

Significance in terms of the geographic scale

Planning rule changes issued to manage National Forests directs forest managers to take into account the best available science to protect air, water, wildlife, and other important natural resources at a landscape-level. Aerial surveys cover 100% of forested land cover in the Pacific Northwest on an annual basis. Field studies that explore the utility of integrating aerial survey data with other natural resource planning efforts have important cost saving significance across all ownerships throughout the Region.

Biological impact and/or political importance of the issue

Dead wood provides critical habitat for many species of wildlife, plants, fungi, and invertebrates. Managing diverse habitats in a sustainable manner that protects biodiversity is a biological imperative and a political reality. Snag densities and down wood are also important factors in predicting fire severity. Current tools for assessing the ‘current’ dead wood landscape are time consuming and expensive to implement. Aerial survey provides an existing data source to address this data gap cost effectively, which may greatly reduce the cost, in both time and money, of dead wood landscape assessment.

Feasibility or probability that the project will be successfully completed

Discretionary base funding in 2005 for a pilot study in the Upper Sycan Watershed in predominately Ponderosa pine and Eastside mixed conifer habitat types was completed August 29, 2005. Preliminary analysis resulted in a high level of confidence in the current snag density assessment*.

Average snags/acre =	16.321
Var_{st}=	2.125
S_e =	1.458
Bound=	2.435
Upper Limit=	18.755
Lower Limit=	13.886
Current Level of Precision (%)=	15

*Data analysis based on snags ≥ 10 in. dbh and ≥ 6 ft. tall. Similar parameters were used for aerial survey data analysis employing plot based generated conversion factors to “predict” percentage of trees within the diameter class of interest. Results from aerial survey predicted 5.17 trees per acre accumulated over a ten year period. Survey data not converted to diameter breakpoints developed from weighted plot averages would have predicted 13.34 trees per acre killed.

Furthermore, the data strongly supports the contention that aerial survey data will provide conservative estimates of snag densities at landscape scales of 5th field watersheds or larger.

Data collection on FY06 funded portion of the study is currently 80% complete with anticipated completion by the end of the fiscal year.

There is a high probability that this project will meet its accomplishment objectives provided sufficient sampling is undertaken in a variety of representative habitat types. Funding for continuation in FY07 will result in sampling of 6 of the 7 major wildlife habitat types in the Pacific Northwest. This project has the full support of Region Six aerial observers and cooperators.

DESCRIPTION:

a. Background:

Annual cooperative insect and disease aerial detection surveys have recorded 'current year disturbance events' since 1947. Forest land managers interested in managing for healthy forests in the context of ecosystem management must evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags, down wood and other wood decay elements.

Recent development of the "DecAID Advisor" has provided an important tool for analyses considering dead and decaying wood. DecAID is an Internet-based synthesis of published scientific literature, research data, wildlife databases, forest inventory databases and expert judgment and experience. It addresses current vegetative conditions (unharvested and managed); provides relevant summaries of snags and down wood; and presents information on wildlife use of snags and down wood. It also provides information on insects and pathogens and their role in creating and retaining dead wood.

One important aspect of dead wood analyses is ascertaining the current status of snags and down wood in the vicinity of the analysis area. Aerial survey data can aid managers in developing a picture of the 'current situation' for the incidence and condition of snags and potentially down wood across a landscape. Initial work done in 2005 to evaluate the relative accuracy of using aerial survey data to capture the extent and severity of these disturbance events over time on a landscape scale was encouraging as it supports our contention that aerial survey data can reliably predict conservative estimates of snag densities at the appropriate scale.

b. Methods:

For our analysis, we'll look at accessible watersheds representing the Montane mixed conifer and Westside Lowland Conifer-Hardwood Forest wildlife habitat types in 2006 and the Southwest Oregon mixed conifer habitat types in 2007. Additional habitat types will be surveyed if time and money allow.

The study area will be stratified based on wildlife habitat types and the heterogeneity within those habitat areas as determined by an extensive survey and analysis of available vegetation surveys, aerial photos and/or satellite imagery.

Following stratification, twenty randomly selected samples (ArcView Random sample point generator developed by Marla Downing and Vern Thomas, Forest Health Technology Enterprise Team) will be collected from at least five different stands within each identified strata. Analysis of the pilot survey data will estimate the number of samples needed to obtain a density estimate

that is within 20% of the mean, 90% of the time. Analysis will also determine the optimal plot size needed within each stratum to meet this objective (Bate et al. 1999).

The results of our analysis will be used to indicate the current distribution of snag sizes and densities as well as dead wood biomass in selected 5th field watersheds.

Reference

Bate, Lisa J.; Garton, Edward O.; Wisdom, Michael J. 1999. Estimating Snag and large tree densities and disturbances on a landscape for wildlife management. Gen. Tech. Rep. PNW-GTR-425. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.
http://www.fs.fed.us/pnw/pubs/gtr_425.pdf

c. Products:

1. User available spatial and tabular data summaries based on aerial survey data for intersection with HUC's and user defined wildlife habitat types. Information will assist managers in forest and project planning by generating "current conditions" histograms for comparison with 'ideal' unharvested condition histograms generated from forest inventory plots.
2. Qualitative and quantitative assessment of bark beetle related mortality relative to aerial survey recorded mortality.
3. Fuels assessment for the selected study watershed, and analysis of correlations with aerial survey data.

d. Schedule of Activities:

Winter 2006: Analyzed Sycan River watershed data. Prepared and presented poster at 2006 FHM work conference.

Spring 2006: Performed preliminary analyses to stratify 5th field watershed study area representing 2 major wildlife habitat areas (Montane mixed conifer and Westside lowland conifer-hardwood forest). Conducted pilot survey with FHP crew and finalized random plot selection and sampling methodology for summer field crew.

Summer 2006: Conduct remaining field work with summer crew. Collection of field data is 80% complete as of this writing (8/23/06).

Fall 2006: Analyze data.

Winter 2007: Prepare report, poster and product for representative habitat types.

Spring 2007: Perform preliminary analyses to stratify 5th field watershed study area representing two additional major wildlife habitat areas (Southwest Oregon mixed conifer and additional TBA). Conduct pilot survey with FHP crew and generate randomly selected plots for summer field crew.

Summer 2007: Conduct field work with summer crew.

Fall 2007: Analyze data.

Winter 2008: Prepare report, poster and product for representative habitat types.

e. Progress/Accomplishments: Study areas selected for 2006 included Westside lowland conifer-hardwood habitat types within the Middle Clackamas River Watershed, Mt. Hood National Forest and Montane Mixed Conifer habitat types within the Five Mile and Fifteen Mile watersheds. Study areas were delineated and stratified by vegetative condition and field sampling is underway with anticipated completion by the end of the fiscal year.

COSTS¹:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
2006				
Administration	Salary	\$19,350	\$4,300	50% fire, 50% wildlife
	Overhead			
	Travel	\$7,371		
Procurements	Contracting			
	Equipment	\$1,000		
	Supplies	\$500		

	Item	Requested FHM EM Funding	Other-Source Funding	Source
2007				
Administration	Salary	\$20,160	\$4,480	50% fire, 50% wildlife
	Overhead			
	Travel	\$7,740		
Procurements	Contracting			
	Equipment	\$1,050		

	Supplies	\$525		
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¹Cost estimates are based on the following:

Summer survey crew: salary = \$645/day x 30 days = \$19,350

Travel for summer crew = 81 days @ \$91/day @ = \$7,371

Equipment = \$1,000 for summer vehicle

Supplies = \$500

Total project cost for 2006= \$28K

Other source funding includes each year 2 weeks time for a fuels specialist and 2 weeks for a wildlife biologist. FHP personnel will also contribute 4 weeks time each year for conducting pilot surveys and analysis.

Total project cost for FY2007 with an estimated 4.44% added economic adjustment = **\$30K**

2006/2007 total project cost = \$58K